
WOODS HOLE OCEANOGRAPHIC INSTITUTION
1930

multiscale autonomous surveys in support of SPURS

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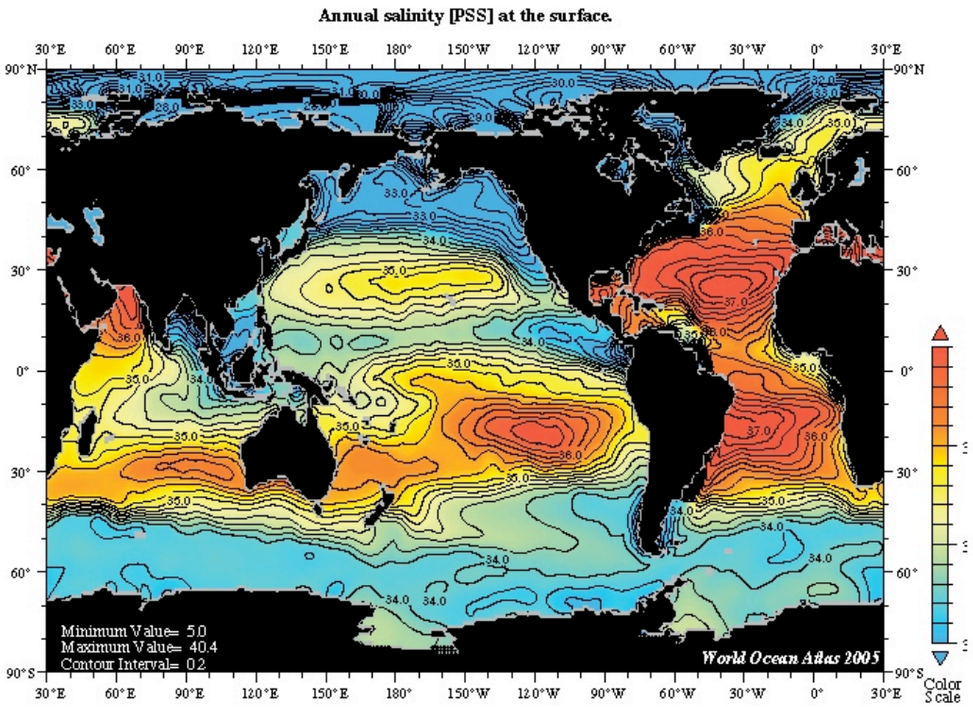
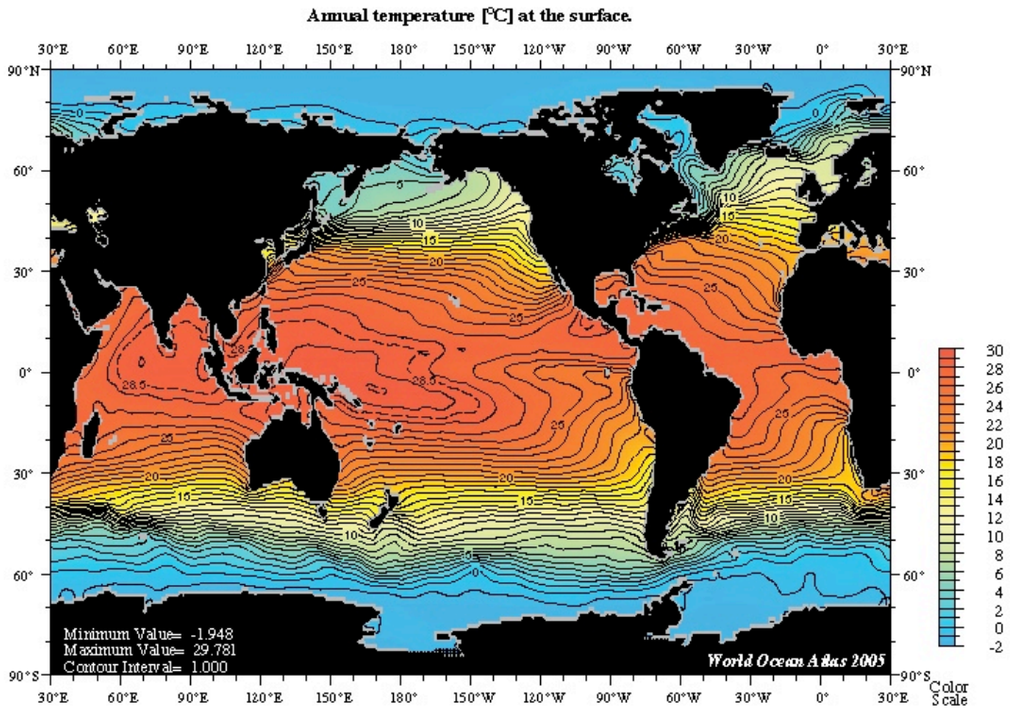
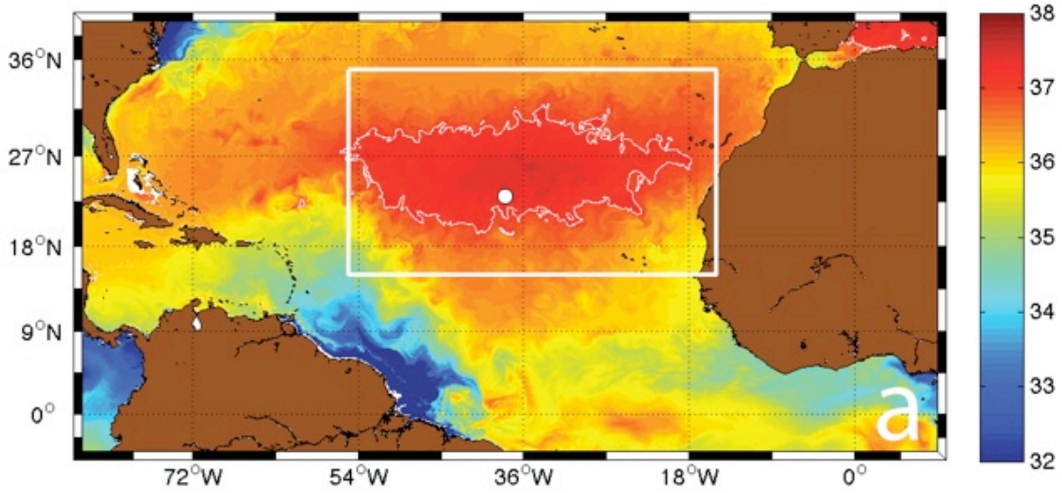
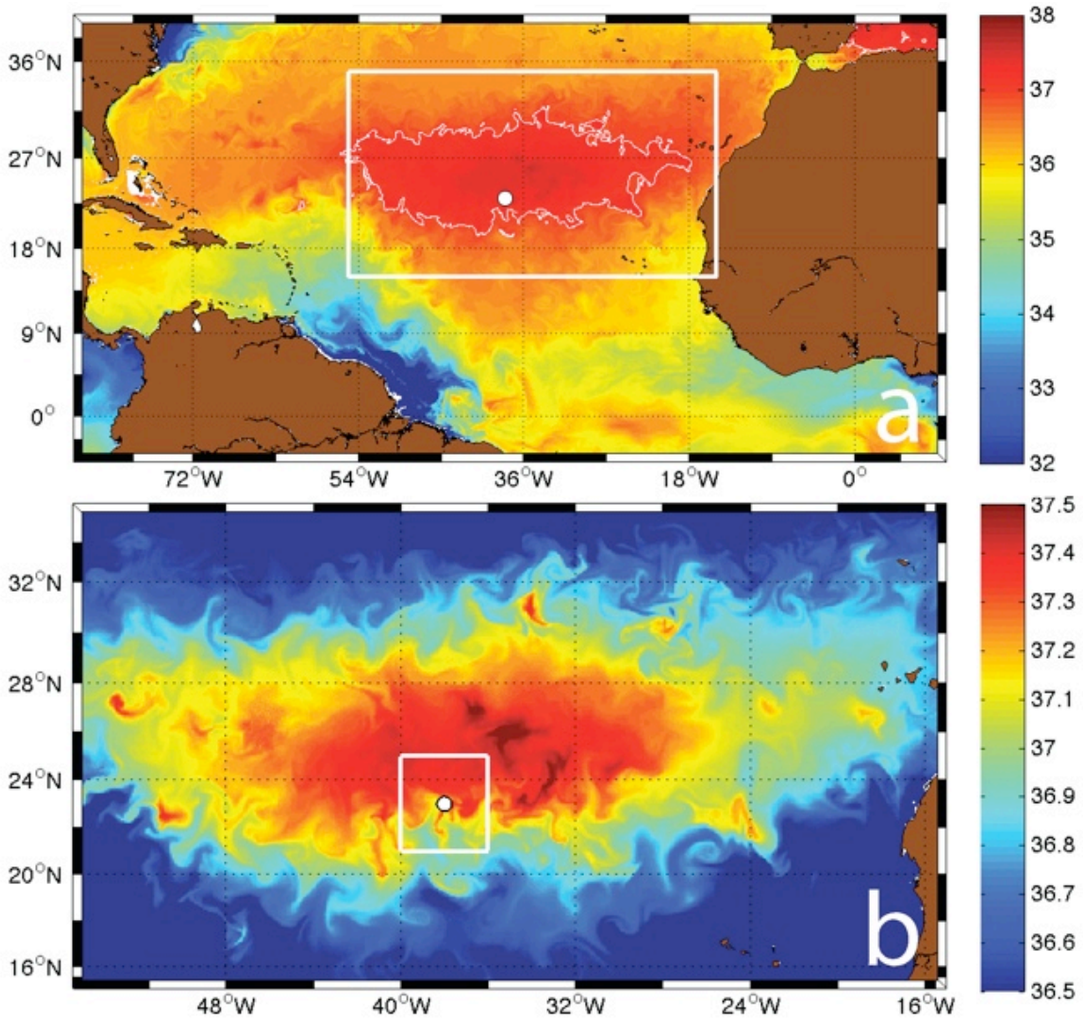




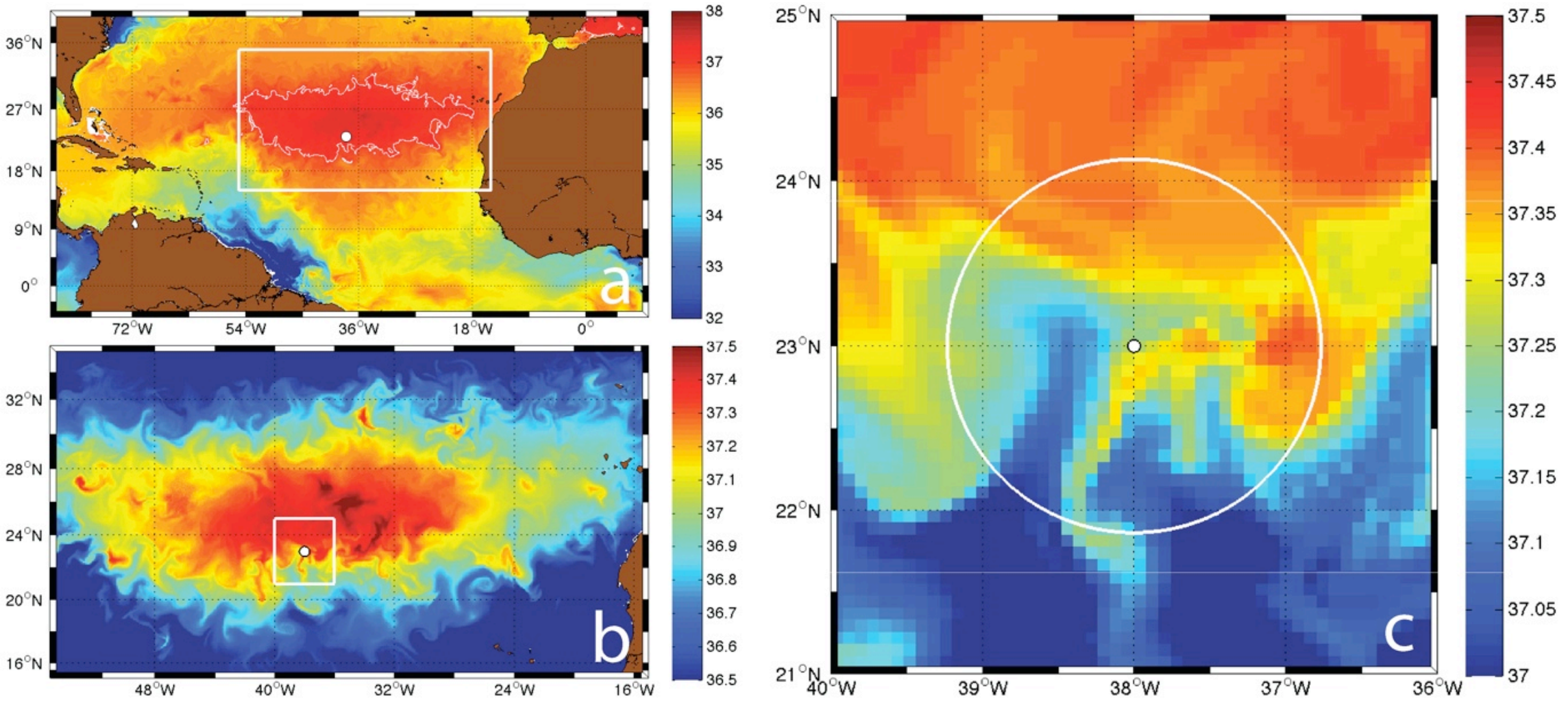
surface salinity snapshot from HYCOM



surface salinity snapshot from HYCOM



surface salinity snapshot from HYCOM



objective:

to directly measure the detailed structure of upper-ocean salinity, its temporal evolution, and its relationship to larger-scale atmospheric and oceanic forcing.

contributions to SPURS:

- characterization of upper-ocean salinity on previously undersampled spatial and temporal scales

- direct measurement of time-dependent horizontal gradient terms to aid closure of local and regional hydrological budgets

questions:

- What is the character of the upper-ocean salinity field at the limits of our present observational capabilities?

- How does variability on these scales contribute to and/or reflect the processes responsible for surface salinity patterns, including the salinity maximum?

- To what extent is atmosphere-ocean interaction (and by extension, the hydrological cycle and the climate system) sensitive to the detailed structure of upper-ocean salinity and temperature?

- How can multiscale field observations best constrain, improve, and/or interpret numerical models and remote sensing tools?

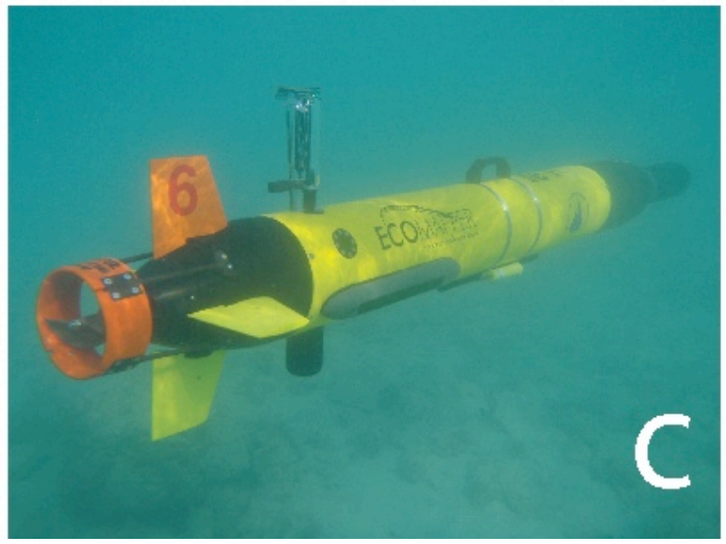
$$\overbrace{Q_0 - R_S|_{-h}}^{\text{surface forcing}} = \overbrace{\int_{-h}^{0} \rho_0 c_p \frac{\partial T}{\partial t}\, dz - F_T|_{-h}}^{\text{1D processes}} + \overbrace{\int_{-h}^{0} \rho_0 c_p \left(u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y} + w\frac{\partial T}{\partial z} \right) dz}^{\text{advective terms}}$$

$$-(P - E) = \frac{1}{S_0}\int_{-h}^{0} \frac{\partial S}{\partial t}\, dz - \frac{F_S|_{-h}}{S_0} + \frac{1}{S_0}\int_{-h}^{0} \left(u\frac{\partial S}{\partial x} + v\frac{\partial S}{\partial y} + w\frac{\partial S}{\partial z} \right) dz,$$

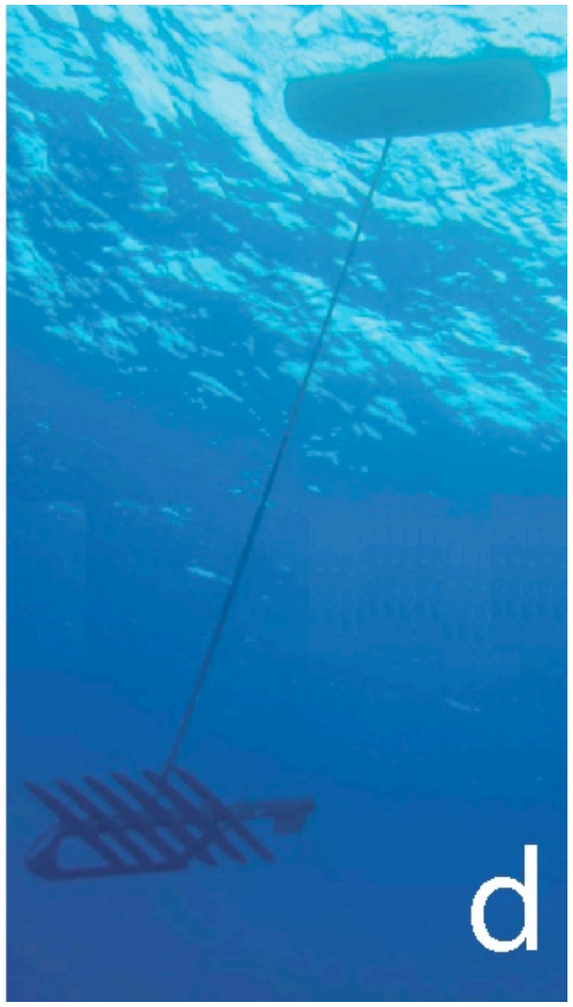
from feng et al. (2000)

slocum

iver2/ecomapper



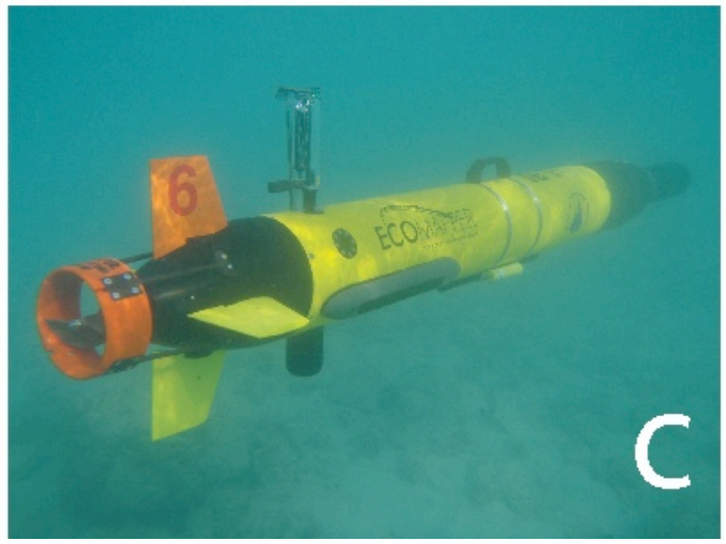
waveglider



slocum

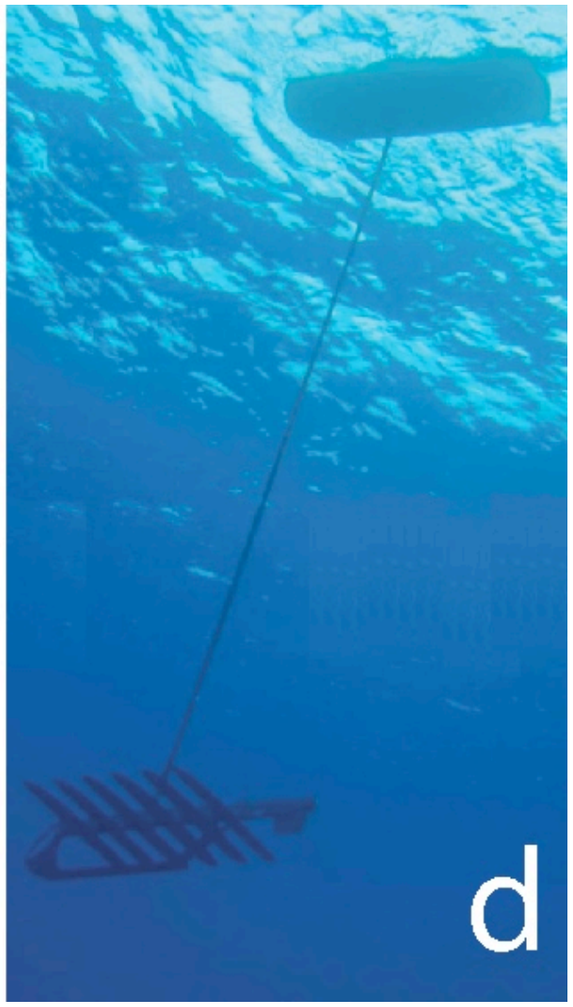
n=6-8
T=30 d
v=25 km/d
dx=1 km
dz=20 cm

iver2/ecomapper

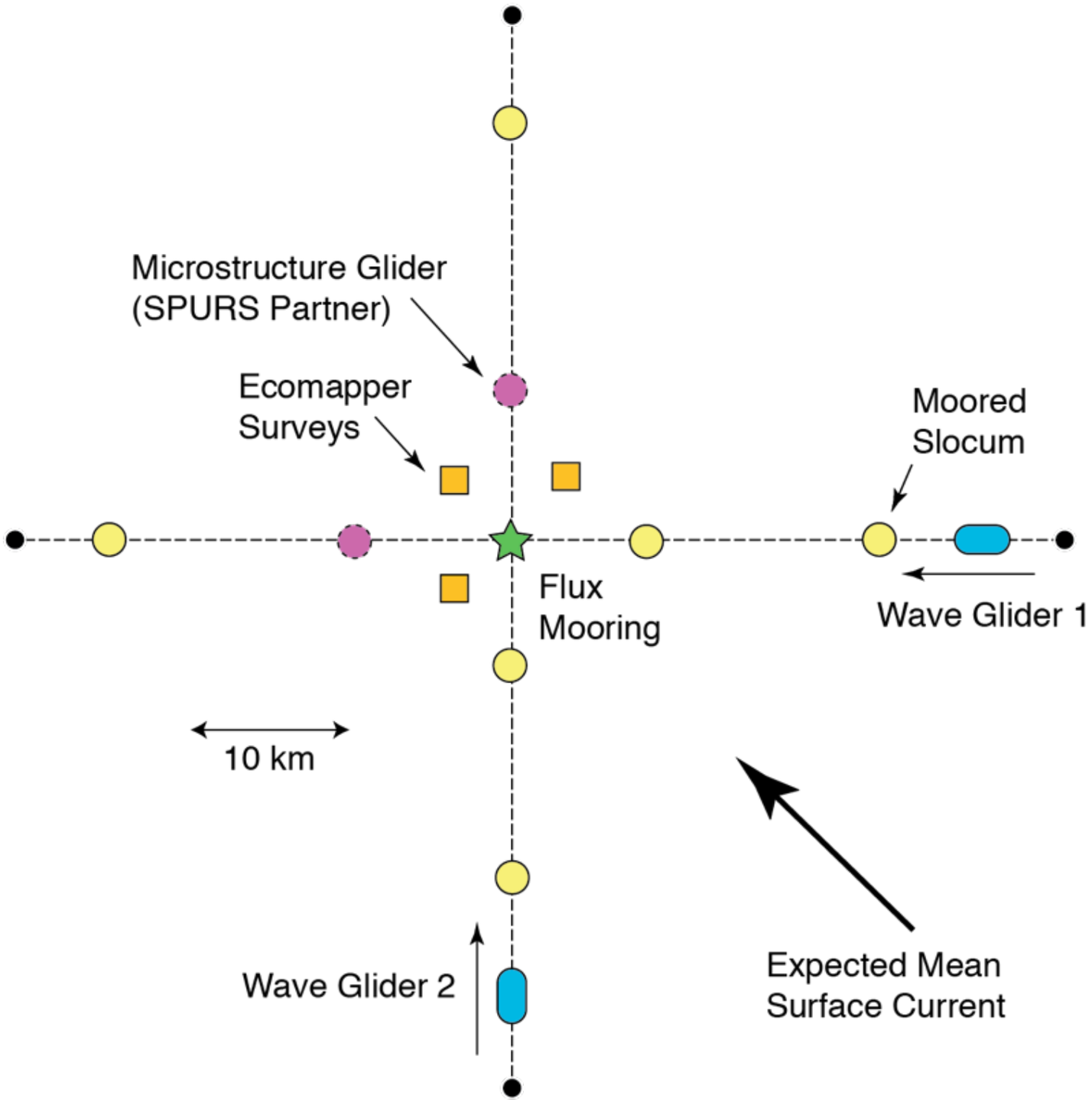


n=2
T=0.25 d
v=150 km/d
dx=2 m

waveglider



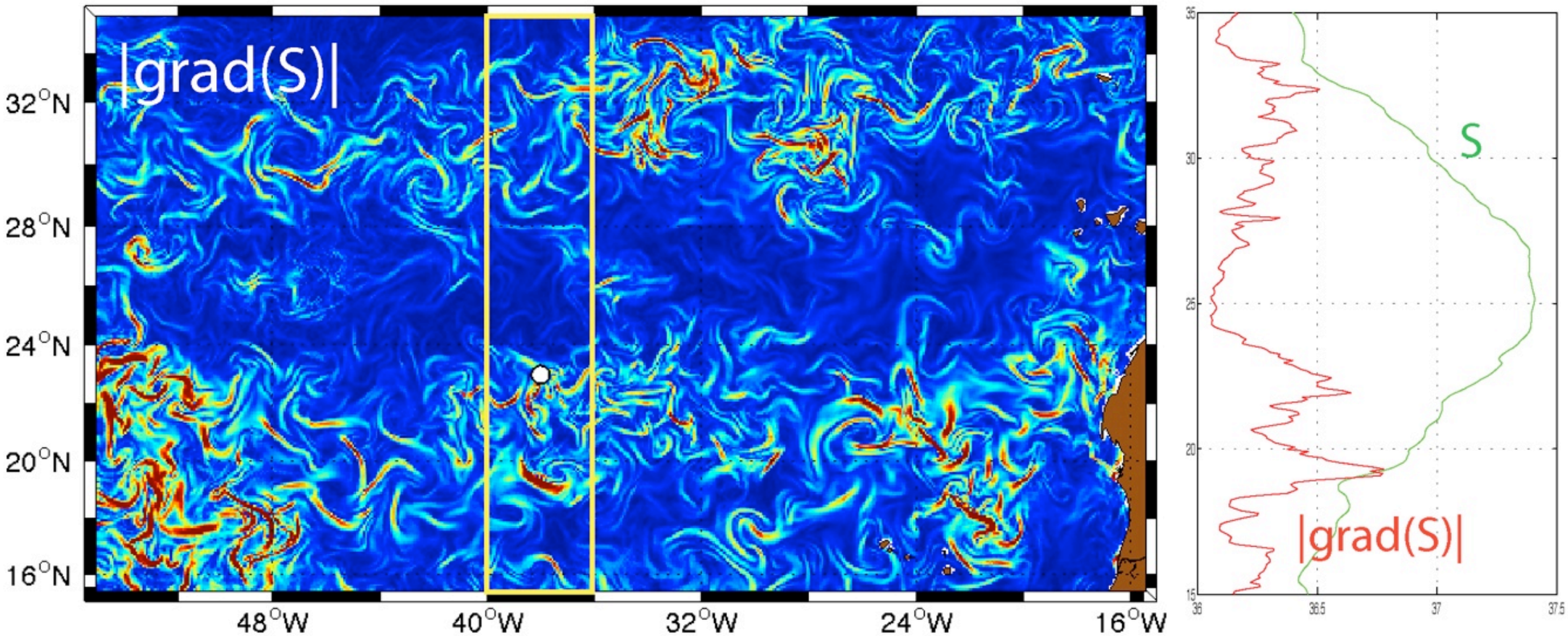
n=2
T=365 d
v=40-50 km/d
dx=100 m



obsolete strawman

100 km

Next larger scale: Seagliders, Argo Floats, Drifters, ...


|grad(S)|
32°N
28°N
24°N
20°N
16°N
48°W
40°W
32°W
24°W
16°W
S
|grad(S)|
25
20
15
36
36.5
37
37.5

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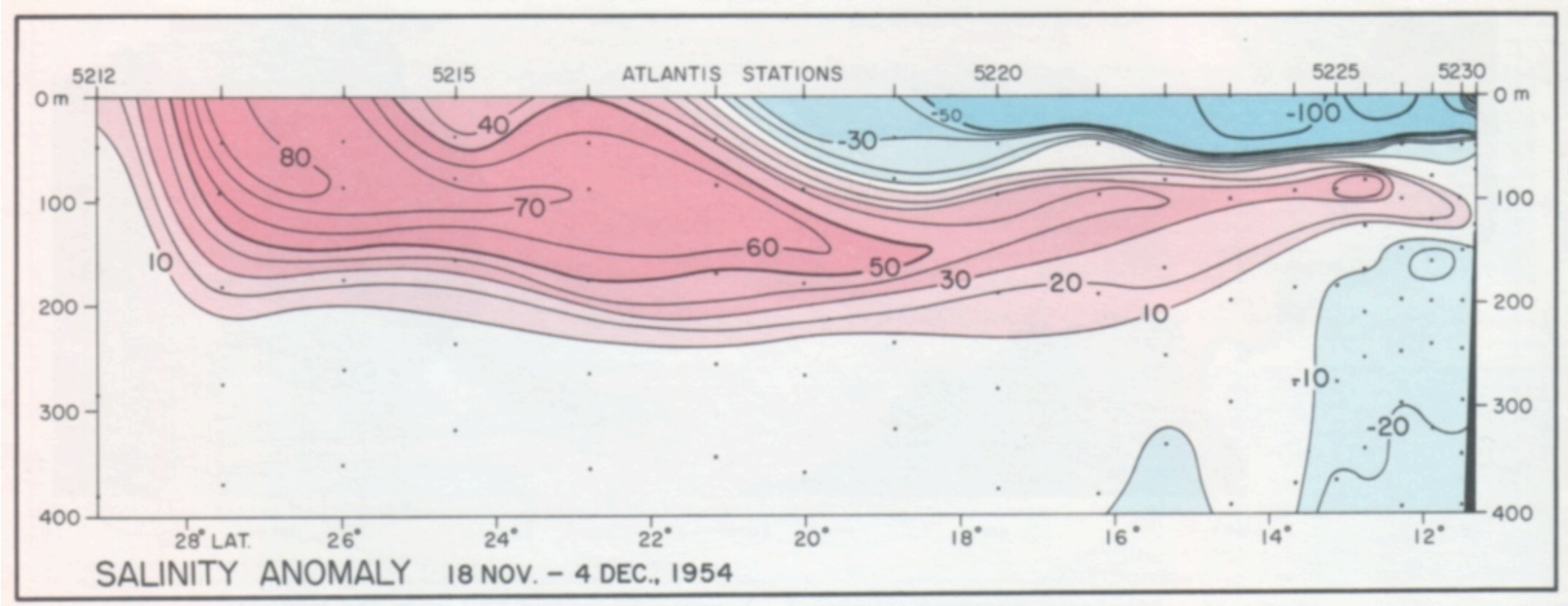
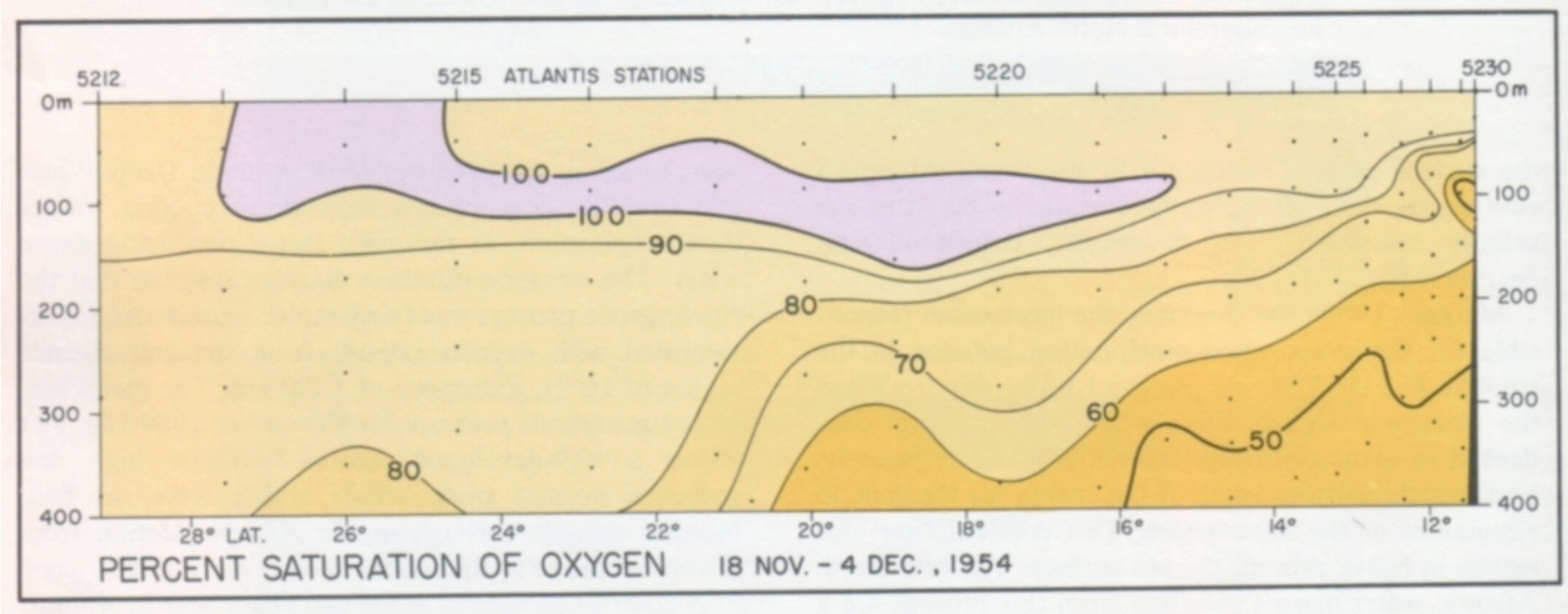
vertical limits?

from feng et al. (2000)





from worthington (1976)

surface forcing | 1D processes | advective terms

$$Q_0 - R_S|_{-h} = \int_{-h}^{0} \rho_0 c_p \frac{\partial T}{\partial t}\, dz - F_T|_{-h} + \int_{-h}^{0} \rho_0 c_p \left(u\frac{\partial T}{\partial x} + v\frac{\partial T}{\partial y} + w\frac{\partial T}{\partial z} \right) dz$$

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vertical velocity?

from feng et al. (2000)

surface forcing | 1D processes | advective terms

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